

10-2

Skills Practice

Logarithms and Logarithmic Functions

A) Write each equation in logarithmic form.

1. $2^3 = 8$

2. $3^2 = 9$

3. $8^{-2} = \frac{1}{64}$

4. $\left(\frac{1}{3}\right)^2 = \frac{1}{9}$

B) Write each equation in exponential form.

5. $\log_3 243 = 5$

6. $\log_4 64 = 3$

7. $\log_9 3 = \frac{1}{2}$

8. $\log_5 \frac{1}{25} = -2$

C) Evaluate each expression.

9. $\log_5 25$

10. $\log_9 3$

11. $\log_{10} 1000$

12. $\log_{125} 5$

13. $\log_4 \frac{1}{64}$

14. $\log_5 \frac{1}{625}$

15. $\log_8 8^3$

16. $\log_{27} \frac{1}{3}$

D) Solve each equation or inequality. Check your solutions.

17. $\log_3 x = 5$

18. $\log_2 x = 3$

19. $\log_4 y < 0$

20. $\log_4^1 x = 3$

21. $\log_2 n > -2$

22. $\log_b 3 = \frac{1}{2}$

23. $\log_6 (4x + 12) = 2$

24. $\log_2 (4x - 4) > 5$

25. $\log_3 (x + 2) = \log_3 (3x)$

26. $\log_6 (3y - 5) \geq \log_6 (2y + 3)$

10-3 Skills Practice**Properties of Logarithms**

A) Use $\log_2 3 \approx 1.5850$ and $\log_2 5 \approx 2.3219$ to approximate the value of each expression.

1. $\log_2 25$

2. $\log_2 27$

3. $\log_2 \frac{3}{5}$

4. $\log_2 \frac{5}{3}$

5. $\log_2 15$

6. $\log_2 45$

7. $\log_2 75$

8. $\log_2 0.6$

9. $\log_2 \frac{1}{3}$

10. $\log_2 \frac{9}{5}$

B) Solve each equation. Check your solutions.

11. $\log_{10} 27 = 3 \log_{10} x$

12. $3 \log_7 4 = 2 \log_7 b$

13. $\log_4 5 + \log_4 x = \log_4 60$

14. $\log_6 2c + \log_6 8 = \log_6 80$

15. $\log_5 y - \log_5 8 = \log_5 1$

16. $\log_2 q - \log_2 3 = \log_2 7$

17. $\log_9 4 + 2 \log_9 5 = \log_9 w$

18. $3 \log_8 2 - \log_8 4 = \log_8 b$

19. $\log_{10} x + \log_{10} (3x - 5) = \log_{10} 2$

20. $\log_4 x + \log_4 (2x - 3) = \log_4 2$

21. $\log_3 d + \log_3 3 = 3$

22. $\log_{10} y - \log_{10} (2 - y) = 0$

23. $\log_2 s + 2 \log_2 5 = 0$

24. $\log_2 (x + 4) - \log_2 (x - 3) = 3$

25. $\log_4 (n + 1) - \log_4 (n - 2) = 1$

26. $\log_5 10 + \log_5 12 = 3 \log_5 2 + \log_5 a$

10-4

Skills Practice

Common Logarithms

A) Use a calculator to evaluate each expression to four decimal places.

1. $\log 6$

2. $\log 15$

3. $\log 1.1$

4. $\log 0.3$

B) Use the formula $\text{pH} = -\log[H^+]$ to find the pH of each substance given its concentration of hydrogen ions.

5. gastric juices: $[H^+] = 1.0 \times 10^{-1}$ mole per liter

6. tomato juice: $[H^+] = 7.94 \times 10^{-5}$ mole per liter

7. blood: $[H^+] = 3.98 \times 10^{-8}$ mole per liter

8. toothpaste: $[H^+] = 1.26 \times 10^{-10}$ mole per liter

C) Solve each equation or inequality. Round to four decimal places.

9. $3^x > 243$

10. $16^v \leq \frac{1}{4}$

11. $8^p = 50$

12. $7^y = 15$

13. $5^{3b} = 106$

14. $4^{5k} = 37$

15. $12^{7p} = 120$

16. $9^{2m} = 27$

17. $3^{r-5} = 4.1$

18. $8^{y+4} > 15$

19. $7.6^{d+3} = 57.2$

20. $0.5^{t-8} = 16.3$

21. $42^{x^2} = 84$

22. $5^{x^2+1} = 10$

D) Express each logarithm in terms of common logarithms. Then approximate its value to four decimal places.

23. $\log_3 7$

24. $\log_5 66$

25. $\log_2 35$

26. $\log_6 10$

10-5

Skills Practice

Base e and Natural Logarithms

Use a calculator to evaluate each expression to four decimal places.

A)

1. e^3

2. e^{-2}

3. $\ln 2$

4. $\ln 0.09$

B)

Write an equivalent exponential or logarithmic equation.

5. $e^x = 3$

6. $e^4 = 8x$

7. $\ln 15 = x$

8. $\ln x \approx 0.6931$

C)

Evaluate each expression.

9. $e^{\ln 3}$

10. $e^{\ln 2x}$

11. $\ln e^{-2.5}$

12. $\ln e^y$

D)

Solve each equation or inequality.

13. $e^x \geq 5$

14. $e^x < 3.2$

15. $2e^x - 1 = 11$

16. $5e^x + 3 = 18$

17. $e^{3x} = 30$

18. $e^{-4x} > 10$

19. $e^{5x} + 4 > 34$

20. $1 - 2e^{2x} = -19$

21. $\ln 3x = 2$

22. $\ln 8x = 3$

23. $\ln (x - 2) = 2$

24. $\ln (x + 3) = 1$

25. $\ln (x + 3) = 4$

26. $\ln x + \ln 2x = 2$